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ABSTRACT

A history of theories of transformational generative grammar is presented, and four theories are characterized as: Chomsky's initial theory, Chomsky's standard theory, the semantically-based theory, and finally Chomsky's nonstandard theory. The main issue appears to be the question of what determines sentence meaning. Specifically, it is stated that Chomsky's nonstandard theory is in opposition to McCawley's nonstandard theory and to Chomsky's standard theory, the major revision in Chomsky's nonstandard theory being the hypothesis that sentence meaning depends not only on the deep structure but also on the surface structure. Chomsky's nonstandard theory is examined in order to answer two questions: whether it admits a theory whereby it is possible to state whether or not transformations change meaning; and whether it admits that deep structures, but not intermediate structures, determine certain meanings. It is concluded that Chomsky's nonstandard theory is not clear on these two questions. A nonstandard theory is then proposed which differs from Chomsky's in that it attempts to explain how semantic representations of sentences are determined and how Pi and Pn participate in their determination. It is concluded that the greater accuracy of one theory or the other can only be determined after further descriptive study within the framework of both theories. (AM)

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GRAMMATICAL TRANSFORMATIONS AND CHANGES OF MEANING

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1. REVIEW OF THE HISTORY OF THE THEORY OF TRANSFORMATIONAL GENERATIVE GRAMMAR

It is well known that the theory of transformational generative grammar was created by Noam CHOMSKY during the second half of the fifties (1). Since then, in almost fifteen years, we have seen certain developments in the theory. In particular, different hypotheses have been proposed concerning the relationship between syntax and semantics. Regarding this problem we can distinguish approximately four formally different theories of transformational generative grammar.

We have first the theory presented by Chomsky (1955) and (1957). We will call this the initial theory. It is assumed in this theory that the meaning of the sentence depends on its phrase markers (or P-markers) and its transformational marker (or T-marker). Briefly, the meaning of a sentence is considered to be determined by the constituency of kernel sentences which make up its construction, and by the process through which it is derived from these kernel sentences by transformations.

Secondly, we have the theory of Chomsky (1965) which replaced the initial theory. We will call this Chomsky's standard theory (2). Following contributions by Lees, Klima, Fillmore, etc. to the refinement of the initial theory, Katz and Postal proposed modifications such that the T-marker of a sentence would not contribute to its meaning; taking this into account, Chomsky revised the entire theory of transformational generative grammar. He assumes in this theory that only the categorical and lexical components are used to determine the meaning of the sentence. In other words, the semantic interpretation of the sentence depends only on its deep structure and not on its surface structure or on the process of its derivation.

Until recently, this theory has been accepted by most transformationalists, and much syntactic research on English and other languages has been accomplished within the framework of this theory.

Thirdly, strongly influenced by the principle underlying the standard theory, by which the deep structure, i.e. the starting point for the application of transformations, is the sole determiner of meaning, a group of young transformationalists have been led to construct more and more abstract, deeper and deeper, deep structures; in the end they have come to reject the notion of base form, or syntactic deep structure, in the sense of Chomsky's standard theory, and to assume the role

of transformations to be to convert the semantic representations of sentences into their surface structures. This theory no longer needs the semantic component as an interpretive component, and does not recognize it. Following Chomsky we will call this theory the semantically based theory (3).

Finally, in his most recent article (in press b), Chomsky attacked the semantically based theory and renounced his own standard theory as well. He replaced it by another. In this new theory, the interpretation of the sentence depends on both deep and surface structures, and the meaning of a sentence is determined by these two structures. Henceforth we will call this new theory Chomsky's non-standard theory (4).

2. THE GENERAL FRAMEWORK OF THE THEORY OF TRANSFORMATIONAL GENERATIVE GRAMMAR.

We have seen, then, that several different theories of transformational generative grammar have been proposed. Of the four theories mentioned above, three have been proposed by Chomsky himself, who seems to consider that his standard theory is a revision of his initial theory and that his non-standard theory is a revision of his standard theory (5). On the other hand, the third position, the semantically based theory, has been presented by its proponents as distinct from and in opposition to Chomsky's standard theory.

Faced with these different theories, it is necessary to precisely characterize and compare them. Thus, Chomsky has extracted the following general notions and formal structure, and has used them to characterize the different theories (6). Assume that a grammar contains a class of transformations, each converting P-markers into other P-markers. We will call the syntactic structure generated by the grammar a finite series, $P_1, P_2, \ldots, P_n$ of P-markers satisfying the following conditions:

(1) (i) P_n is a surface structure
(ii) Each P_i is formed by applying a certain transformation to P_{i-1} in a way permitted by the conditions on grammatical rules.
(iii) There is no $P_o, P_1, \ldots, P_n$ meets conditions (i) and (ii).

Call K the class of syntactic structures. P_1 will be called the K-initial P-marker. Furthermore, a grammar must have a lexicon consisting of lexical items, each of which is associated with a lexical transformation which satisfies the following condition:

(2) A lexical transformation associated with the lexical item I maps a phrase-marker P containing a substructure Q into a phrase-marker P' formed by replacing Q by I.

Different theories will result according to the conditions imposed on the structures Q which may be replaced by lexical items, as well as on the methods of application -- in particular the order of application -- of lexical and non-lexical transformations. One might impose the following condition:

(3) Given $(P_1, \ldots, P_n)$ in K, there is an i such that for $j < i$, the transformation used to form P_{j+1} from P_j is lexical, and for $j \geq i$, the transformation used to form P_{j+1} from P_j is nonlexical.

This condition means that the non-lexical transformations can apply only after all the necessary lexical items in the sentence have been introduced. The P_i satisfying this condition will be called the post-lexical syntactic structure.

Chomsky's standard theory satisfies, besides the above conditions, the following conditions:

(4) Q in (2) is identical for all lexical items and Q is a special symbol.

(5) K-initial structures are derived by a context-free phrase structure grammar.

(6) The surface structures are subject to certain well-formedness conditions.

(7) The surface structure of a sentence is converted into its phonetic representation by phonological rules.

(8) The post-lexical structure (i.e. the deep structure) is converted into its semantic representation by semantic rules.

Chomsky defines standard theory as "any elaboration of this theory of grammar" satisfying these conditions.

The theory presented in Chomsky (1965) is standard in this sense and we have called it Chomsky's standard theory (7). We will call

(although Chomsky did not do so) a non-standard theory a theory which satisfies conditions (1) and (2), but which violates at least one of conditions (3) - (8).

In fact, a number of diverse non-standard theories appeared after Chomsky (1965). Chomsky (in press b) was written partly to criticize these non-standard theories. However, he himself proposed a non-standard theory as a revision of his own standard theory. His non-standard theory rejects condition (8) and replaces it by the following condition:

(8') The meaning of a sentence is determined by its post-lexical and surface structures.

Chomsky describes this condition explicitly as follows [8]:

semantics: $(P_j, P_n) \rightarrow$ semantic representation.

Here, P_j and P_n are respectively the post-lexical and surface structures of a sentence. Conditions (8) and (8') are conditions which define the relationships between syntax and semantics in a grammar. In this article we are interested only in the problem of the relationship between syntax and semantics, and we will not consider those criticisms which Chomsky (in press b) makes of the non-standard theories different from his own which do not concern this problem.

The non-standard theory of McCawley is non-standard in various ways; in particular, it is non-standard with respect to the condition defining the relationships between syntax and semantics. It does not accept (8); in this theory, as has already been stated, the semantic representations of sentences are the point of departure for transformations and, following the general framework of Chomsky, the condition which replaces (8) in this non-standard theory can be written as follows:

(8'') The K-initial structures of sentences are their semantic representations.

The entities corresponding to the semantic rules of the standard theory do not exist in McCawley's nonstandard theory, which does not allow an interpretive semantic component.

However, McCawley's non-standard theory does have a property in common with Chomsky's standard theory; the following statement applies to both:

(9) The meaning of a sentence does not depend on its surface structure.

This statement is an immediate consequence of (8) or (8''). From this point of view, Chomsky's non-standard theory differs from his standard theory and also from McCawley's non-standard theory. One might refine the common consequence of (8) and (8'') as follows:

(10) The meaning of a sentence is determined independently of the function of non-lexical transformations.

This might be said in other terms:

(11) Non-lexical transformations do not change meaning.

This expression is inexact from a certain point of view and could provoke misunderstandings. We will return to this point later. The non-standard theory of Chomsky rejects (10) and inasmuch as (11) can be considered as equivalent to (10), we can say that it likewise denies (11).

If we summarize Chomsky's standard theory by conditions (1) - (8) and if we compare it with his non-standard theory, the latter seems to have come about as a revision of the former. On the other hand, the difference between the non-standard theories of Chomsky and McCawley is remarkable[9]. However, from the viewpoint of the history of the development of the transformational tradition, if not from that of the formal comparison of the theories, one cannot deny that statement (11) established in Chomsky's standard theory has been accepted as a fundamental, guiding principle and has precipitated the development of non-standard tendencies following Chomsky's standard theory, including McCawley's non-standard theory. One could say with some reason that historically the non-standard theory of Chomsky is in opposition to both McCawley's non-standard theory and Chomsky's standard theory.

3. CHOMSKY'S NON-STANDARD THEORY

Chomsky's non-standard theory is, as stated above, obtained from his standard theory by replacing condition (8) with condition (8'). Chomsky renounced the standard theory and adopted the non-standard theory because he admitted that phenomena eluding all explanation existed within the framework of his standard theory, but he judged that he could account for them by revising his theory. We cannot repeat here all the details of the facts and all the ways in which they necessitate revision of the theory. We shall content ourselves to recall briefly some conclusions concerning two facts -- the two facts which Chomsky treats in the greatest detail -- in order to prepare ourselves for later discussions.

The first is that which concerns the focus and presupposition in the sentence. Compare the following two sentences:

(12) Did John give the book to BILL?

(13) Did John give Bill the BOOK?

The two sentences (surface structures) pronounced normally have their stress centered on the final word, BILL or BOOK. It is assumed that they are derived from the same deep structure (10). However, the focus and presuppositions they admit are not the same. The constituents which can be the focus are uniquely those which contain the main stress. To BILL, give the book to BILL, and (12) as a whole on the one hand, and the BOOK, give Bill the BOOK, and (13) as a whole on the other hand, are susceptible to being respectively the focus of (12) and (13). Consequently the sentences:

(14) John did something.

and

(15) Something happened.

(or perhaps we should say the meanings they express) can both be the presuppositions of (12) and (13); however, the sentences

(16) John gave the book to someone.

and

(17) John gave something to Bill.

can only be presuppositions of (12) and (13) respectively. Therefore,

(18) No, to someone ELSE.

and

(19) No, to something ELSE.

can only be natural responses to (12) and (13) respectively.

It follows that if focus and presupposition are recognized as part of meaning, we are led to the conclusion that the meaning of the sentence depends not only on the deep structure, but also on the surface structure.

To justify his hypothesis that the meaning depends on surface structure, Chomsky also has recourse to the following phenomenon observed by Jackendoff. If we compare the three sentences:

(20) Not many arrows hit the target.

(21) Many arrows didn't hit the target.

(22) The target was not hit by many arrows.

Formally (22) appears as the passive of (21). But (21) and (22) have different meanings. (22) means the same thing as (20) and constitutes the negation of the proposition:

(23) Many arrows hit the target [11].

By opposition, (21) affirms that many arrows missed the target, and, according to Chomsky, it is the verb phrase which is negated.

Further, Chomsky gives the following sentences:

(24) Not many demonstrators were arrested by the police.

(25) Many demonstrators were not arrested by the police.

Let us add the active form, which Chomsky does not give:

(26) The police did not arrest many demonstrators.

In the set (21) - (23), the quantifier many is attached to the subject of the verb, whereas in the set (24) - (26) it is attached to the object. Here, too, the two forms (25) and (26) which are bound formally by the active - passive relationship are not synonymous; (24) and (26) are synonymous, and express the relationship of an entire sentence, whereas (25) expresses the negation of a verbal phrase. From observation of sentences of this sort, Jackendoff draws the following conclusion. The sentence, active or passive, expresses the negation of an entire sentence if the negative word precedes a quantifier in the surface structure, and expresses the negation of a verb phrase if the order of these two elements is reversed. This is a rule which interprets sentences semantically with the help of information contained in their surface structures. One notes that (21) and (22) on the one hand, and (25) and (26) on the other hand, are related by the

active-passive relationship and consequently should be derived from the same deep structure (post-lexical structure), but they acquire different meanings due to the semantic interpretive rule which applies to surface structures. On the basis of facts such as these, Chomsky came to establish principle (8'). It follows that principle (8) is rejected, as well as statement (10).

4. GRAMMATICAL TRANSFORMATIONS AND CHANGES OF MEANING

If we accept that (11) is a paraphrase of (10), (11) is rejected with (10) and it seems to follow that:

(27) Non-lexical transformations can change meaning.

However, the logical relationship between (8') and (27) is not so simple. Indeed, in order that the claim according to which a transformation may be said to change meaning or not may be taken seriously, we must assume that what is transformed and what results from the transformation each have their own meaning. If we accept principle (8) and if we assume that the meaning of a sentence is determined by its deep structure, we can admit statements like (11) implicitly through the natural hypothesis that P markers deriving successively from a deep structure by means of transformations receive the meaning of that deep structure. In this case, for the formal construction of the theory, it would be meaningless to ask whether the intermediate P-markers are associated with meanings or not. The real significance of (11) would reside only in its expressive figurative style. On the other hand, if we reject (8) and accept a principle like (8'), it could become an essential problem concerning the formal construction of the theory to ask if the assertion that transformations can change meaning is a valid assertion in the theory. Indeed, if we interpret literally a hypothesis like (8) or the expression given above:

(28) semantics: $(P_i, P_n) \rightarrow$ semantic representation

this signifies only that the meaning of an entire sentence is determined by certain properties of its deep and surface structures and implies nothing at all about the question of knowing if the deep structure alone determines by itself certain aspects of meaning. A fortiori, it does not follow either that the intermediate P-markers possess their own meaning or that they do not.

The hypothesis according to which,

(29) The deep structure determines certain aspects of meaning.

is a hypothesis independent of (28). If we admit (29) as well as (28), we are justified in saying that the entire transformational component, if not each transformation, is applied to a deep structure and changes or does not change its meaning. In this case, so that hypothesis (28) will not be redundant, it is necessary that:

(30) There exist deep structures which are subject to changes of meaning by the transformational component.

Furthermore, for a statement like (27) to be meaningful, we must admit that a certain meaning is associated with each intermediate P-marker. For example, one would impose the following condition on each syntactic structure $P_i, \ldots P_n$:

(31) For all j, $i \leq j \leq n-1$, a certain meaning is associated with the series $P_i, \ldots, P_{i+j}$.

Here P_i is the post-lexical structure. Under this condition, the statement that a transformation which derives the P-marker P_{i+j+1} from the P-marker P_{i+j} changes the meaning means that the meanings associated with the series $P_i, \ldots, P_{i+j}$ and $P_i, \ldots, P_{i+j+1}$ are distinct.

5. EXAMINATION OF CHOMSKY'S EXPOSITION

What can be said about what Chomsky claims in his non-standard theory concerning the problem we have just discussed? It is not clear. We shall examine his hypothesis in two stages. First we shall ask if he admits the stronger hypothesis, that is, if he admits a theory in which it is possible to say of transformations whether or not they change meaning, and if he does, what the implications of this hypothesis are. Next, we shall ask if we should consider whether he admits the weaker hypothesis, that is, if he admits that deep structures, but not intermediate structures, determine certain meanings.

As for the first point, the general exposition given by Chomsky does not permit us to say which decision he has made.

However, after having presented the rule of semantic interpretation mentioned above, which functions at the level of surface structures where it concerns the mutual order of a quantifier and a negative, he states: "the principle of interpretation of surface structures seems clear, and in addition, the transformations that form passives can be left in a simple form(though they will drastically change meaning, if they change the order of quantifier and negation.)" (12) If the statement in parentheses is taken seriously, it would mean that the P-markers to which passivization transformations apply have already acquired the active sense (13). If this is the case, we must truly consider that passivization transformations drastically change meaning,

and we must say that Chomsky has implicitly imposed a stronger condition than (28) on his theory.

The fact that passivization may change meaning has already been recognized in Chomsky (1957) and does not depend on the intervention of negation. In the famous examples:

(32) Everyone in the room knows at least two languages.

(33) At least two languages are known by everyone in the room.

The two languages which each person speaks may be different from one person to the other in the active (32), whereas the passive (33) means that two particular languages are spoken by every person in the room. This problem is tied in to the order of universal and existential quantifiers in a logical formula. To understand the essence of the problem, it would be better to take the following example:

(34) Everyone understood something.

(35) Something was understood by everyone.

If we note by U(a, b) the fact that a understood b, (34) and (35) are normally interpreted by:

(36) $(\forall x)\ (\exists y)\ U(x, y)$

and

(37) $(\exists y)\ (\forall x)\ U(x, y)$

This would imply that passivization radically changes meaning. It must be added that, for many people, (34) and (35) are both considered ambiguous and have meanings, respectively, of (37) and (36) besides those of (36) and (37). Might this be the reason why Chomsky did not refer to examples like (34) and (35) to justify his claim that surface structure, too, participates in the determination of meaning? One could say, however, that (36) and (37) have the natural meanings of (34) and (35) respectively. To say simply that (34) and (35) are ambiguous would not be satisfying. The Japanese sentences corresponding to (34) and (35):

(38) Subete no hito ga nanika o rikai sita.

(39) Nanika ga subete no hito ni rikai sareta.

are interpreted respectively as (36) and (37), according to my judgment; it seems impossible to interpret (39) with the meaning of (36), and it is

also rather difficult to interpret (38) with the meaning of (37). In the Japanese case, without utilizing the passive construction, we can have the same effect, simply by changing the word order: We can combine (38) with

(40) Nanika o subete no hito ga iikai sita.[14]

Let us return to our main discussion; Chomsky's statement that passive transformations radically change meaning should perhaps be taken simply figuratively and not seriously. It can only be a matter of an impressionistic presentation to say that the two surface structures which are only distinguished by the application or non-application of passivization can have extremely different meanings. One could say that, in the hypothesis where the semantic interpretation depends only on deep and surface structures, the question of knowing whether or not a certain meaning has already been determined before the application of passivization is the source of no difference for the formal constitution of the theory. To ask questions such as this would be absurd and assertions such as "passivization can change meaning" could only be figurative. If such is the case, there is no objection to be made.

Now let us pass on to the second question, which is to find out whether or not we should assume that the deep structure, whatever the role of intermediate structures, determines by itself certain meanings. Here, we are concerned with the fact that Chomsky claims that all grammatical relations are determined by the deep structure in his non-standard theory, as in his standard theory. For the meaning of a sentence to be determined, the grammatical relationships between its lexical items must be fixed, but it is not clear that, inversely, one can conclude that the grammatical relations between lexical items determine any meaning. Of course, there are cases in which one can draw this conclusion, and it is even the ordinary case, but it is important to note that there are also cases where such a conclusion is not obvious.

Let us consider, for example, (12) or (13). The subject-verb relationship connects John and gave, the indirect object-verb relationship connects Bill and gave, and the direct object-verb relationship connects book and gave. We can say that these three grammatical relationships determine the meaning:

(41) John gave Bill the book.

and it would be natural to assume that this meaning is contained, in one way or another, in the meaning of the interrogative sentences (12) and (13). Therefore, for a sentence like (12) or (13), it would be equally natural to consider that the deep structure, whose role would be to define the gram-

matical relations between the lexical items, determines a sort of meaning -- perhaps the meaning of (41) or its interrogation -- and that the suface structure adds some other elements of meaning -- presuppositions, etc.

But now let's consider sentences like (34) and (35). In both, one can assume that everyone is the subject of understood and something is the object. This information is, of course, necessary to the determination of the meanings of these sentences; if on the other hand something were the subject and everyone the object of understood, we would get the semantically anomalous sentences:

(42) Something understood everyone.

and

(43) Everyone was understood by something.

However, could one admit that the grammatical relationships between the lexical items in (34) and (35) determine a certain meaning by themselves? Having recourse to formal logic as in (36) and (37), one would like to express that the information given by the fact that everyone and something are respectively the subject and object of the verb understood, requires that x and y occupy respectively the first and second position of U(,) and consequently excludes, for example, the meaning $(\forall x)\ (\exists y)\ U(y, x)$; it would follow that the grammatical relations defining everyone and something as subject and object, defining therefore the common deep structure of (34) and (35), determine the meaning associated with the form U(x, y) in (36) and (37). We will make two comments about this argument.

First, the form U(x, y) is of course a component of a formula of predicate calculus, the same as (36) or (37), but this does not imply that it represents by itself a unity of meaning. If one wishes to make such an assertion, one must clarify what the meaning is which one wishes to associate with a form like U(x, y). One could assume that U(x, y) is ambiguous and possesses all the meanings of logical formulas which are obtained by binding the free variables x and y of U(x, y); the meaning of U(x, y) would be disambiguated by binding the variables. Then one could ask if ambiguous meanings of this sort deserve to be retained; we will pass over this problem, as we will return to a similar problem later.

We continue here our discussion by admitting that if we associate this ambiguous meaning to U(x, y) not only (34) and (35), but also

(44) Everyone understood something.

(45) Someone understood something.

(46) Someone understood everything.

and the sentences formally linked to these by passivization must be considered as containing in their deep structures the same meaning, U(x, y), which is determined by the grammatical relations between the lexical items of which they are composed. Of course it is not equivalent to say that these sentences possess the same deep structure; but one must admit that the type of elements to which words like everyone and someone should belong in the semantic interpretation is determined by surface structure. It follows that the assumption that words like everyone and someone are already present in deep structures, and consequently, too, that the assumption that (34), (44), (45), and (46) possess different deep structures, cease to be justified and one could just as well propose the hypothesis that these sentences possess a single abstract deep structure like:

(47) x understood y.

and that words like everyone and something are introduced later by certain transformations. But the formulation of a hypothesis of this sort would imply an essential revision of the notion of deep structure in the standard theory of Chomsky and it would be difficult to accept his non-standard theory simply as a revision of the standard theory. If we admitted, however, that words like everyone and something are already present in the deep structure, the non-standard theory of Chomsky would appear to be a simple revision of his standard theory, but if this hypothesis were not justified independently of the intention to connect these two theories, the fact of making them similar would be without logical justification.

Secondly, one could assert that the fact that, in (34) for example, everyone is the subject and something is the object of understood implies not only that x and y occupy respectively the first and second position of U(x, y), but also that they are bound by means of universal and existential quantifiers. This seems reasonable. Indeed, the meaning determined by the deep structure of (34) would be different from the meanings determined by those of (44) - (46). However, (34) and (35) have a common deep structure and a unique meaning must be associated with this deep structure. What is this meaning? (34) and (35), as surface structures, possess meanings which correspond to (36) and (37). Could we assume, then, that the common deep structure of (34) and (35) possesses an ambiguous meaning which is disambiguated in (36) and (37), in the surface structures? However, one may wonder whether meanings of this kind are admissable as natural semantic

entities. We assumed that (34) and (35) were linked transformationally and derived from the same deep structure because of the correlation of their surface forms (15). This formal relation does not permit us to establish immediately a deep semantic entity which decomposes into the two meanings which correspond to (36) and (37). In order to affirm that the common deep structure of (34) and (35) already determines a certain meaning which is disambiguated in the end into the meanings corresponding to (36) and (37), it is necessary to justify the existence of this kind of meaning independently of the formal fact that (34) and (35) are superficially connected by passivization.

As complement to the preceding discussion, consider the following problem. A transitive verb determines a relationship between two terms, the subject and the object. This relationship is not generally symmetrical. It is essential to know which of the two terms is the subject and which is the object. But in certain particular cases the relation defined by a transitive verb is symmetrical, eg. resemble, marry, meet, etc. In these cases, it would be natural at least from a semantic viewpoint, to allow deep structures where the grammatical relationships defining subject and object are abstract. For example, one could assume that an expression like resemble $\left\{ \begin{matrix} a, b \\ \end{matrix} \right.$ constitutes the common deep structure of a resembles b and b resembles a where $\left\{ \begin{matrix} a, b \\ \end{matrix} \right.$ would designate a non-ordered set. Suppose then that we extend the use of such deep structures to the general case and assert that understood $\left\{ \begin{matrix} a, b \\ \end{matrix} \right.$ is the deep structure common to a understood b and b understood a, associated with a unity of meaning which is disambiguated in the surface structures with the meanings of the two corresponding sentences. This analysis cannot be accepted, not only because the symmetrical transitive verbs are exceptional, but also, and more importantly, because, the acceptance of a semantic unity of this kind could only be very strange.

(16) In the case where one would assume that the deep structures already define certain meanings, we have just examined what those meanings would be.

In summary, under this hypothesis that the existence of a semantic unity common to (21) and (22) or to (34) and (35) is admissible, it is not clear what this entity is nor what reasons justify proposing it.

Chomsky himself did not claim definitively that the deep structure alone would determine certain sorts of meaning; rather, he stated simply that the grammatical relations on which semantic interpretation depends are determined by the deep structure. In any case, inasmuch as it has not been clarified what the hypothesis is which is admitted concerning what we have discussed, it is impossible to say if it is justified to consider Chomsky's non-standard theory as a development of his standard theory, and, if so, in what sense it is.

THE PRINCIPLE OF HARMONY BETWEEN GRAMMATICAL TRANSFORMATIONS AND MEANINGS

As we have seen, the question of knowing whether, in Chomsky's non-standard theory, some sort of meaning is associated with deep structures, or more generally, with intermediate P-markers, is not clear. One could consider that the theory remains neutral on this point. In this section we will give a theory which carries with it an explicit hypothesis on this matter.

In this theory we take (31) as our hypothesis. We will define it more explicitly here as follows:

(48) For each syntactic structure $P_1, \ldots, P_i, \ldots, P_n$, a semantic entity σ_j is associated with the series $P_i, \ldots, P_j$ for all j. $i \leq j \leq n$. In particular, σ_n is the semantic representation of the sentence corresponding to the given syntactic structure.

Here P_i is the post-lexical structure of the syntactic structure. "Semantic entity" formally designates an element of the space of the semantic representations or of some space derived from it in a "natural manner". Under this hypothesis, it is legitimate to speak of changes of meaning when a P-marker P_j is converted into another P_{j+1} by a transformation T.

Beside (48) let us place another hypothesis which we can call the hypothesis of harmony between transformations and meanings.

(49) Grammatical transformations cause only "natural" changes of meaning.

Formally, for each transformation T, if we consider all the pairs (P_j, P_{j+1}) of P-markers, such that P_{j+1} is derived from P_j by means of T, we obtain a function from one semantic space in another; hypothesis (49) requires such functions to be "natural".

It could be said that a hypothesis like this is empty of meaning since we have not clarified what is meant by "natural" changes of meaning.

We do not even know what semantic representations are, formally. A fortiori we cannot formally define spaces of semantic entities which should be obtained from the space of semantic representations by "natural" operations -- for example, identification with respect to some equivalence relation. However, the establishment of a hypothesis like (49) cannot be considered entirely meaningless. If we propose an analysis allowing a hypothesis like (49), we are led to admit that certain semantic entities supposedly associated with each P-marker as well as certain changes in their associations caused by transformation are "natural".

The theory of transformational generative grammar claims that the only 'natural" changes of syntactic form are effected by grammatical transformations. One must therefore characterize formally the notion of "natural" semantic change, or the notion of change affecting the semantic entities that grammatical transformations can cause. To attain this end we must first admit intuitively the distinction between "natural" and "non-natural" changes, and try to formalize the intuitive notion after having effected several attempts at analysis.

We will now attempt to describe sentences containing quantifiers according to the theory suggested above. However we will not attempt here to establish a system of rules which would cover the whole range of facts touching on this phenomenon; we will limit the corpus rather arbitrarily. Our intention is simply to furnish a concrete illustration for the above abstract discussion. As for finding out if the description given below can be incorporated into the complete system of English grammar, and how one may evaluate it with respect to English grammatical systems based on other theories, that is a question I shall leave for the future. We shall treat here only examples (34) and (35), and not examples like (20) and (21) which Chomsky has discussed in Chomsky (in press b).

The problem arises from the fact that passivization seems to change certain meanings. But, in the most common case, it causes no such change. Indeed, the sentence

(50) John understood the theory.

and its passive

(51) The theory was understood by John.

have the same meaning (17). In sentences like these, John and theory are nouns denoting specific things. Saying that the grammatical relationships subject-verb and object-verb exist between these words and understood, means that particular relationships exist between these things and the action which these nouns and the verb understood denote and constitute a particular state of affairs. (50) and (51), considered as defining the same grammatical relations, designate the same state of affairs. If we take recourse to a pseudo-logical formula, John and the theory correspond to logical constants and if we designate them by a and b, (50) and (51) both correspond to U(a, b). By replacing John in (50) by everyone we have

(52) Everyone understood the theory.

and

(53) The theory was understood by everyone.

which also have the same meaning. These two sentences correspond to $(\forall x)\, U(x, b)$. Further, if we replace the theory by something we obtain

(34) and (35), which are, as we have seen, crucial examples concerning the relationships between transformations and meaning. But notice what follows. Until now, we have assumed that something in the sentences (33) and (35) is interpreted as an existential variable (logical variable bound by an existential quantifier). However, as was mentioned above in footnote (14), there is a different usage of something. This other use consists of using it as a name given temporarily to a specific thing. In this usage as a noun, something acts like the theory in (52) and (53). The speaker has in mind a particular thing, but in this case he does not attempt to specify it by means of a more distinct and narrow notion -- for example theory -- or he doesn't want to. We distinguish this use of something from that which corresponds to the use of logical existential variables, and we will call it "specific" (18). Now, if we take something in (34) and (35) in the specific sense, the two sentences are synonymous. It is the same situation which explains that (52) and (53) are synonymous. The synonymity of (34) and (35) is lost only if something is interpreted in a non-specific way.

Describing the distinction between the specificity and non-specificity of something remains to be done independently of the way in which we treat the relationship between the two sentences (34) and (35). At first glance, this might appear to be a semantic problem. But it can be seen that it is not, and that it is rather a syntactic problem, if we associate with it the fact that in negative sentences, something can alternate with anything. For example, because of this alternation, the sentence:

(54) John understood something.

has as its negation

(55) John did not understand anything.

However,

(56) John did not understand something.

is also a grammatical sentence; if something is non-specific in (54), its negation is (55), and if specific, it is (56). According to Chomsky's standard theory, two somethings would be distinguished in the deep structure, something 1 and something 2, and one would assume that the latter corresponds to non-specific something; one can then formulate the transformation which replaces something by anything in negation such that it applies to something 2. But this formulation seems unsatisfying. In effect, distinguishing two somethings by indices 1 and 2 comes to nothing more theoretically than noticing the existence of two homophonous words. Of course, the fact that something can be specific as well as non-specific should not be compared with the existence of accidental homonyms like, for example bank, edge of a river, and bank, repository for funds. Not only the indefinite pronoun something, but also indefinite nouns in general, have this ambiguity and the essence of this phenomenon seems to relate to the fact that in human languages a noun which is associated with a notion is used as a name denoting an individual belonging to this

notion, as well as a variable which includes its extension.

If we treat separately the problem of the changing of meaning by the passive transformation illustrated by (34) and (35) and that of the ambiguity of the indefinite pronoun something, we can say nothing more. But if we relate them, we can describe them as follows. As has been stated above, (34) and (35) are synonymous when the occurrences of something are interpreted as specific, which amounts to saying that passivization does not change meaning.

Could we not then say that all occurrences of something in the forms where passivization applies are specific? It would follow that passivization would not change meaning in general. How then could we explain the non-specific something? We could assume that it derives from the specific something by a "despecification" transformation, operating after the application of passivization.

We shall now give the process of derivation of (34) and (35) by following this idea. The post-lexical structures common to these sentences are[20]:

(57) Everyone understood something.

where something is assumed to be specific as in any post-lexical structure. If we apply neither despecification nor passivization to (57), it becomes a sentence (a surface structure) which contains specific something. If passivization applies to (57), however, it will become (58):

(58) Something was understood by everyone.

Something is also interpreted here as specific and there is no change of meaning. Then, if despecification applies to (57) or (58), something becomes non-specific and, at this stage, a change of meaning appears. By designating by a logical constant a the thing denoted by the specific something in (57) and (58) we can say that the meaning $(\forall x)\ U(x, a)$ is changed to $(\forall x)(\exists y)\ U(x, y)$ or $(\exists y)(\forall x)\ U(x, y)$ through the despecification transformation.

In this description, passivization does not change meaning, but another transformation, despecification, is allowed which does change certain meanings. However, it is not the same thing to say that this transformation changes meanings as to say that it is passivization which does so. Indeed, despecification can be considered as the materialization of the essential ambiguity of something (or more generally of indefinite nouns), and it is not the same to mechanically record the difference in meaning which we observe in (34) and (35). Furthermore, the change of meaning from $(\forall x)\ U(x, a)$ to $(\forall x)(\exists y)\ U(x, y)$ or to $(\exists y)(\forall x)\ U(x, y)$ is considered to be linguistically "natural".

This change means that a noun is freed from its use as a name and it is considered as a variable ranging over the domain where this name is applicable. If, in the same sentence, there is also a word which corresponds to a universal variable, the order of the universal and existential variables is determined by the order of the two words corresponding to the two variables in the structure to which despecification applies.

Let us return to the general discussion. We will consider now the way in which meanings are to be determined according to the description of the above example or, more generally, according to the theory which allows the principle of harmony between grammatical transformations and meanings. Given a syntactic structure $P_1,\ldots,P_i,\ldots,P_n$, a meaning is first determined by its post-lexical structure, and is then transformed step by step by means of transformations (included here are, of course, the cases of transformations which do not change meaning at all) until we reach the semantic representation of the sentence associated with the given syntactic structure.

The meanings connected with post-lexical structures are determined by grammatical relations, and the formal constitution of the part of the semantic component of a transformational grammar which determines these meanings by interpreting the post-lexical structures will appear to be almost like a semantic component of the standard theory. Thus, to say that meaning is changed in a "natural" manner when the P-marker, P_j, is converted to another, P_{j+1}, means from the viewpoint of semantic interpretation that a projection rule is linked to the transition from a series of markers, $P_1,\ldots,P_i,\ldots,P_j$ to another, $P_1,\ldots,P_i,\ldots,P_{j+1}$.

In all we have discussed we can note an important difference between Chomsky's non-standard theory and that which is given here. In the former, it is only claimed that the semantic representations of sentences are determined by the pairs (P_i,P_n) and the question of how they are determined and especially how P_i and P_n participate in their determination remains obscure. We do not know to what properties of P_i and P_n and in what manner the semantic projection rules apply successively to determine the semantic representations. As we saw in the last section, saying that grammatical relations are determined by post-lexical structures is not enough to justify the idea that the set of semantic rules is divided into two classes of rules, one class of rules applying to the constituent structures of post-lexical structures P_i and which determine the meanings of the P_i, and another class of rules applying to the meanings of the P_i thus determined. It seems that we lack justifications for the claim that Chomsky's non-standard theory can be considered as a simple revision of his standard theory (including the revision of the semantic part). On the other hand, the non-standard theory suggested above can be considered from a certain viewpoint as a revision of

Chomsky's standard theory, and also, from another viewpoint as a revision of his initial theory.

Alongside Chomsky's non-standard theory, we have placed another non-standard theory. We can decide if one of the two is explanatorily more adequate than the other for the given empirical facts only after elaborating more examples of descriptions of concrete facts within the framework of both theories (21).

FOOTNOTES

1. This article is the translation of "Bunpôteki henkan to imi no henka" submitted to Gendai gengogaku, edited by S. Shibata et al., with the exception of certain notes concerning only terminological remarks which would not be necessary for the reader sufficiently familiar with the English or French literature on the theory of transformational generative grammar.

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2. For the term "standard theory" see section 2.

3. For the semantically based theory, see McCawley (1968). It is possible that McCawley is the only person who, in articles already published, has definitively rejected Chomsky's deep structure and claimed that semantic representations are the starting points for transformations. But the general tendency that challenged Chomsky's standard theory has attracted many associates of the early days of Chomsky, among whom P. Postal, G. Lakoff, J. Ross, etc, besides McCawley, play the most important roles, as well as C. Fillmore, and J. Gruber from slightly different points of view. But it is not certain that all of them accept exactly the same hypothesis as McCawley on the relation between syntax and semantics.

4. For the term "non-standard theory" see the following section.

5. We will examine later the question of whether or not this historical view is justified. See section 6.

6. See Chomsky (in press b). The initial theory of Chomsky cannot be characterized in this general framework. This is because in this theory the lexical items are assumed to be introduced in the sentence by means of rewrite rules and not by means of transformations. The notion of generalized base form is also not present.

7. Of course, this definition is not precise; Chomsky (1965) allows a few options regarding certain hypotheses and, consequently does not really present one theory. But this is not important for the discussion of our problem.

8. See Chomsky (in press b). He adds here the additional condition that the grammatical relationships are determined by P_i. We will return to this point below, in section 5.

9. In McCawley's non-standard theory, (3) for example, must be rejected along with (8) as an immediate consequence of (8").

10. The post-lexical structures in a standard theory are called deep structures (Chomsky(in press b)). But Chomsky also uses the term " deep structure " in his non-standard theory.

11. This is what Chomsky claims. However, it is more exact to say that (20) and (22) are not the unconditional negatives of (23) but the negatives with the presupposition "Some arrows hit the target". If one is given the fact that no arrow hit the target, neither (20) nor (23) is acceptable as a true statement. In this regard, to see the difference between the meanings of (21) on the one hand and of (20) and (22) on the other, we can note that (21) is compatible with the fact that many arrows hit the target while (20) and (22) are not.

12. Emphasis supplied by S.-Y. Kuroda.
The reason why Chomsky says "transformations" is that he seems to assume that more than one transformation acts in the formation of passives. See Chomsky (in press a).

13. Of course, this P-marker is not the surface structure of the active form, because passivization is not the last transformation.

14. One should note here that in English and in Japanese the indefinite pronoun something or nanika can be used as a name denoting a particular object as well as a variable bound by the existential quantifier. The two uses are distinguished by means of the terms "specific" and "non-specific". Something or nanika, employed in the specific sense must be considered logically as a constant or a proper noun; so the problem of the difference of meaning caused by the difference of the order of universal and existential quantifiers disappears. If we take something and nanika in (34) and (38) in the specific sense, we understand that there exists a thing which is understood by everyone; however, the meaning is different from that of (37). Furthermore, it implies that of (37). Consequently, to claim that sentences like (34) or (38) can be understood with the meaning of (37), one must be completely sure that something or nanika is not used in the specific sense.

15. The meaning of the assertion "transformations which form passives can remain simple" is precisely this.

16. In expressions of this kind, words like "already" must be understood figuratively; of course, they do not concern the order of physical time in one or another aspect of performance of language. If we want to avoid figurative formulations of this kind and require here a formally exact formulation, we should say that the semantic interpretation described as a function from the space of the pairs (P_i, P_n) of post-lexical and surface structures into the space of semantic representations decomposes into a function from the space of deep structures into the space of semantic representations (or in some space derived from the space of semantic representations in a "natural" manner -- for example by identification with respect to a "natural" equivalence relation), and a function from the product space of the latter and the space of surface structures into the space of semantic representations.

17. I do not accept this statement as entirely true. It is legitimate to say that (50) and (51) have different "themes". But differences of meaning of this kind do not concern us here. In this respect it is true that English passivization can "thematize" the object of the transitive verb, but it would be wrong to believe that it always plays this role. For example in

(i) Some dogs are chasing cats.

and

(ii) Cats are being chased by some dogs.

we cannot claim that the "themes" are changed in the same way as they are in (50) and (51). It is essential here that the surface subjects of (i) and (ii) be indefinite and specific. In Japanese, they are accompanied by the particle ga, while in (50) and (51) the surface subjects will be accompanied by the particle wa if they are taken as the "theme" of the sentences. In this case the surface subjects of (50) and (51) could be considered as logical subjects in the sense of Kuroda (1965), (1967), and (1969) whereas the surface subjects of (i) and (ii) are not.

18. The explanation given here of the distinction of the two uses of indefinite nouns, specific and non-specific, is simplified so that no complex fact not related to our present problem intervenes; of course it is entirely insufficient.

Above all, we will admit that the non-specific use of indefinite nouns corresponds to universal variables as well as to existential variables. Furthermore, if one wants to compare exactly the specific and non-specific usage with the distinction between logical variables and constants, one runs up

against the subtle and difficult problem of harmonizing the notion of existence from the point of view of logic or set theory with the notion of existence (in one sense or another) from the point of view of metaphysics or epistemology. In any case, the essence of the specific use of an indefinite noun is to name temporarily a thing belonging to a concept by means of this concept, basing oneself solely on the fact that this thing belongs to this concept. In this act of naming, this thing is not distinguished conceptually from others which belong to the same concept. It is not essential, whether or not we judge that it exists by some principle of metaphysics or epistemology. On the other hand, the denoting of a thing by a definite noun phrase is based on the intention of naming it by distinguishing it from others and by characterizing it among others conceptually. (In linguistic acts, this characterization is not necessarily realized linguistically). In Japanese, the distinction between definite and indefinite nouns is not marked by different articles or by the presence and absence of articles; however, this distinction is reflected not only in the semantics, but also in the syntax in a subtle way, for example, there seems to be a delicate correlation between certain cases of opposition of the particles wa and ga and the opposition of definite and indefinite nouns. Of course we are not claiming that the opposition of wa and ga corresponds exactly to that of definite and indefinite nouns. See Kuroda (1965), chapter 2 or Kuroda (1966). For an interesting article which treats the problem of specific and non-specific nouns in English, see Dean (1968). As was said above, we will not discuss the specific and non-specific uses in general, but we will only use them by limiting ourselves to the special case described in order to illustrate our non-standard theory. The type of non-specific use which Dean treats principally, as for example, indefinite nouns contained in the complements of a verb like want, cannot be linked to logical variables in an obvious way; we shall leave to later studies the task of finding how this sort of non-specific use is to be tied in to the following description of another sort of non-specific use.

19. "After" relative to the order of rules in the sense of the theory of transformational generative grammar.

Of course we are not proposing, in this article, that all occurrences of indefinite nouns be derived from specific indefinite nouns.

20. They are simplified as much as necessary for our discussion.

21. I have indicated in Kuroda (1965) (Chapter 1, reproduced in Reibel-Schane, (1969)), certain problems of Chomsky's standard theory, concerning the treatment of so-called adverbial particles in Japanese (hukuzyisi), of English adverbs like also, even and also of interogation. I proposed to introduce the notion of attachment transformation to solve

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these difficulties. The attachment transformations were considered as transformations which change meaning, and, consequently, a theory like the non-standard theory proposed here, and not like the non-standard theory of Chomsky, had to be implicitly assumed. However, the idea of treating phenomena associated with words like those given above by means of attachment transformations seems to be usable in Chomsky's non-standard theory. The basis of the notion of attachment transformation seems, at least partially, compatible with the two non-standard theories. Naturally, delicate differences may appear in the details of the explanation.